

Perhaps this will in some measure account for the fact that of the Actiniæ collected during the expedition, thirty-nine out of forty-one are described as new species, for which eighteen new genera are diagnosed, and five new families are formed. The large majority of these new forms belong, as might be expected, to the Hexactiniæ of Hertwig, but some belong to the Edwardsiæ, Zoantheæ, and Ceriantheæ; while a new tribe has been provisionally made to receive two forms (*Fenja* and *Ægir*), not at first sight clearly appertaining to the Actinaria. These forms have elongated, cylindrical, vermiform bodies, with an apparently complete body cavity; the oral disk is surrounded with tentacles, and opens into an œsophagus, which is continued into a closed intestine, which opens at the aboral end of the body. There are twelve septal chambers, complete in themselves, with twelve pore openings around the anal opening.

In *Fenja mirabilis* the body is 70 mm. in length and 15 mm. in breadth at the anterior extremity, whilst the posterior part is rather narrower; the surface of the body is smooth and shining.

In *Ægir frigidus* the animal is surrounded with a mucous investment, and the body is but 30 mm. in length; from 8 to 10 mm. in breadth at the anterior extremity, to 4 to 5 mm. in breadth at the somewhat rounded posterior extremity. While in *Fenja* the ovaries do not materially differ from the type in the Actinida, those in *Ægir* greatly approach the form generally met with in the Alcyonida.

It would seem useless to speculate as to the position these strange forms must occupy until something more is known of their structure and something of their development. Dr. Danielssen writes that, if the cœlom is to be regarded as the distinctive feature, then it is evident they cannot be placed among the Coelenterata; but he adds that perhaps too much stress has been laid on the so-called gastro-vascular apparatus as a systematic feature in this group, and that what is called the œsophagus in Actinida is possibly a rudimentary intestinal formation.

We have alluded to these two forms in some detail as being of very special interest, but an almost equal interest attaches to others which are also to be found described, but which our space forbids us to do more than thus generally refer to. In addition to the coloured plates representing the new species, there are nineteen with the various anatomical details, making this memoir one of the best illustrated of the series. It follows so closely on the memoir on the Alcyonida by the same distinguished author, that we cannot but express our admiration for the energy he displays in working out the natural history of the Norwegian coast, which is now better known than that of our own shores.

OUR BOOK SHELF.

Smithsonian Report, 1887. (Washington: Government Printing Office.)

THIS important publication is increasing year by year in value, in consequence of the pains taken to increase the quantity and quality of the records of progress in the various sciences. In the present volume it brings the records of the Institution down to June 30, 1887. We find the proceedings of the Board of Regents and of the Executive Committee,

the Report of the Secretary on the general work of the establishment, the National Museum, and the Bureau of Ethnology. But there is very much more than this, although these matters are by no means of merely local interest. The progress of astronomy, North American geology and palæontology, vulcanology and seismology, geography and exploration, physics, chemistry, mineralogy, zoology, and anthropology, take up no less than 500 pages, and are admirably done. We should add that the record of each branch of science is accompanied by a full bibliography, which largely increases its usefulness. The miscellaneous papers this year deal chiefly with the Western mounds and Indian archæology.

Travels and Discoveries in North and Central Africa. By Henry Barth. (London: Ward, Lock, and Co., 1890.)

FORTY years ago Barth was invited to join a mission which the British Government was about to despatch to Central Africa. He accepted the invitation, and was absent from Europe nearly six years, in the course of which he travelled from Tripoli to Bórnu, and from Bórnu to Timbúktu. The account of his explorations, published in 1857 in German and English, was immediately recognized as one of the most important and fascinating of modern books of travel; and even now, after so long an interval, it has lost but little of its interest. In the present volume, which belongs to the Minerva Library, the first half of the great traveller's elaborate work is reproduced with many of the original illustrations. The books of travel by Darwin and Wallace, which have been reissued in the same series, differ considerably from that of Barth, who was not a naturalist; but, as Mr. Bettany, the editor, says, "to make up for this he is extremely rich in topographical, historical, and anthropological details." Mr. Bettany contributes to the volume a short introduction, in which he brings together some of the leading facts relating to Barth's career.

Weather Forecasting for the British Islands. By Captain Henry Toynbee, F.R.A.S., &c. (London: Edward Stanford, 1890.)

THIS is a most interesting and useful little book, and should be in the possession of all those who take any interest whatever in weather forecasting. It is written with the intention of showing what a single observer can do as regards this subject, supposing him to have a barometer, means for observing roughly the direction and force of the wind, and power to recognize cirrus clouds and the direction from which they are coming. To make the book more complete, the author has added some daily weather charts to illustrate the application of the principles and variations which occur in practice, and to show what can be learnt from them.

The Encyclopædia of Photography. By Walter E. Woodbury. (London: Iliffe and Son, 1890.)

THIS is the second part of the work we noticed before, to be completed in about twelve parts issued monthly. The ground covered is from B to Coffee Process, between which entries will be found information useful to all classes of photographers. Bromide paper, camera-bellows making, carbon process, may be mentioned as among the subjects most fully treated of. When completed, the work will contain over 1000 references, and be illustrated by about 200 explanatory sketches and diagrams by the author.

Japan and the Pacific. By Manjiro Inagaki, B.A. (Cantab.). (London: T. Fisher Unwin, 1890.)

THIS book, so far as it has any elements of interest, appeals rather to politicians than to students of science.

The subject with which the author deals is the relation of Japan to the Eastern Question, and therefore to England and Russia. It is a striking fact that such matters should be discussed in an English work by a native of Japan. Mr. Manjiro Inagaki cannot, however, be congratulated on the way in which he sets forth his ideas. His facts are thrown together so loosely that it is sometimes difficult to make out the propositions which he wishes to prove or to illustrate.

LETTERS TO THE EDITOR.

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Indiscriminate Separation, under the Same Environment, a Cause of Divergence.

I HAVE accumulated a large body of facts indicating that separated fragments of a species, though exposed to the same environment, will in time become divergent. I find that, wherever a species possessing very low powers of migration is for many generations divided into a series of fragments by barriers that do not obstruct the distribution of surrounding species, more or less divergence arises in the separated portions of the species, though, in the same areas, there is no divergence in the environing species whose distribution is not obstructed. I still further find that, whenever the distances intervening between the different fragments are an approximate measure of the time and degree of separate breeding (as is frequently the case, as long as the divergence does not involve any physiological and psychological segregation), these distances are also an approximate measure of the degree of divergence.

The validity of this conclusion is called in question because it is inconsistent with the theory that all divergence is due to diversity of natural selection, and that all diversity of natural selection is due to exposure to different environments. The divergences in the cases above referred to, it is said, are probably due to differences in the environment that are not easily recognized. This was the explanation suggested by Darwin when the facts were reported to him in 1872. The division of a species into isolated portions did not seem to him to furnish any factor that could produce divergence unless it was aided by exposure to different external conditions. The same view is expressed in his "Origin of Species," sixth edition, p. 319.

My reply is twofold. (1) The theory that all the divergences in Sandwich Island land mollusks are due to differences in the environment requires us to believe that there are occult influences increasing in difference with each additional mile of separation, and that these influences control the natural selection of the mollusks, but have no influence on any of the other species occupying the same areas. A theory that involves so heavy an assumption cannot be received when a simpler theory is open to us. (2) I believe I can entirely remove this objection, urged against my conclusion on these purely theoretical grounds, by showing that there are certain causes of divergence, not depending on exposure to different environments, that are necessarily introduced by the division of a species into isolated groups; and that, under the influence of these causes, diversity of habits may arise producing diversity of natural selection, even while the fragments are exposed to the same environment.

I have elsewhere called attention to the fact that the independent breeding of separated groups, so far as we can judge, always tends to produce divergence; and I have shown that, when a species is indiscriminately broken into independent fragments, the tendency to divergence will, on the average, vary in direct proportion to the instability of the species, and in inverse proportion to the size of the fragments, for on these factors depends the probable degree of departure of the average characters of the fragment from the average character of the species previous to its being broken into fragments, and, therefore, the degree of segregation.

I wish now to show that the maintenance of certain classes of characters always belonging to an unbroken species is due to a form of selection that can continue only so long, and so far, as

free crossing continues. Reflex selection is a formative principle, depending on the relations in which the members of an inter-generating group of organisms stand to each other, while they continue to inter-generate; but when two portions of an original species have become so divergent as to compete with each other in the same area without crossing, they form incipient species, and each belongs to the environment of the other. While they are members of the same inter-generating group, their mutual influence results in reflex selection, which maintains the correspondence with each other by which power to cross is preserved; while they are members of groups that do not cross, their mutual influence results in mutual selection that inevitably tends toward the preservation of variations that, through greater divergence, best escape from competition. I have elsewhere defined reflex selection as being the exclusive propagation of those better fitted to the relations in which the members of the same species stand to each other, resulting from the failure to propagate of those less fitted. Among those that are equally fitted to the environment of the species, and therefore equally preserved by natural selection, there is often great difference in the degrees of fitness for sustaining such relations to the rest of the species as will secure an opportunity to propagate. To this class of influences belong the different forms of sexual selection through which the sexual instincts and other sexual characters of the different sexes are kept in full co-ordination. In like manner we must believe that the pollen of any species is kept up to its full degree of potency by the constant selection which results from the failure to propagate of the individuals whose pollen is less potent or whose germs are more difficult to fertilize than the average. We cannot call this sexual selection; but we have to class it as the form of reflex selection through which the physiological co-ordination of the male and female elements with each other is so maintained as to secure full fertility. Again, there is a constant selection of animals that are suitably endowed with the recognition marks and calls by which the different members of the species know each other, and that have the corresponding instincts that lead them to associate with their own kind who are thus endowed. I have elsewhere called this principle of social co-ordination "social selection," and have classed it as a form of reflex selection.

There are several other forms of reflex selection. One of these secures harmony in the habits and modes of life of the different members of a freely inter-generating group of organisms; for individuals, whose habits are not sufficiently co-ordinated with those of the mass of the species to allow of their inter-breeding with them, will fail of propagating. This we may call co-ordinative industrial selection. We are now prepared to understand one reason why independent breeding resulting from indiscriminate separation is in time transformed into segregation. Independent breeding is in its very nature the suspension, not only of one form, but of all forms of reflex selection between the separated portions of the species. The importance of the cessation of natural selection in producing the different stages of the degeneration of organs that are disappearing has been fully discussed by Prof. Romanes (see *NATURE*, vol. xli. p. 437, and previous communications there referred to), who points out that, as the power of the special form of heredity by which any organ is produced has been built up by the many generations of natural selection that have acted in favour of the organ, so the gradual weakening of that power follows the cessation of the natural selection. Prof. Weismann seems to appeal to the same principle when he attributes the disappearance of "rudimentary organs" to the action of "panmixia." Now, in the cessation of reflex selection which follows independent breeding, a similar principle is introduced, and the inevitable result must be the weakening of the power of heredity by which the portions of the species were held in correspondence with each other before their separation. I have elsewhere shown that separate breeding necessarily disturbs unstable adjustments; and we here see that the most stable of the adjustments by which each part of a species is kept in correspondence with every other part gradually becomes unstable under the continued influence of separation. Whenever a species is divided into two portions that do not interbreed, the four forms of reflex selection above described will cease to act between the two portions, and they will continue in sexual, social, physiological, and industrial harmony with each other, only in so far as the force of the old heredity holds them to the old standards. But the power of heredity in these respects will in time fail, if reflex selection is entirely removed. If the